1. For each limit, either evaluate it or show that it does not exist. If you need to approach 
(0, 0) along different paths, some good choices are the coordinate axes (y = 0, and x = 0),
the line y = x, an arbitrary line y = mx, and a parabola y = x^2.

a) \[ \lim_{(x,y) \to (5,5)} \log_{10}(2x^2 + 10y) + x + y \]

b) \[ \lim_{(x,y) \to (0,0)} \frac{x^2 - 2y^2}{x^2 + y^2} \]

c) \[ \lim_{(x,y) \to (0,0)} \frac{x^2 + xy + y^2}{x^2 + y^2} \]

d) \[ \lim_{(x,y) \to (0,0)} \frac{x^2y}{x^4 + y^2} \]

(this problem is a better example of the behavior I mentioned in class).
2. Use the limit definition of the derivative to evaluate both of the partial derivatives of \( f(x, y) = x^2 + xy \)

3. Find all partial derivatives of the following functions

   a) \( g(x, y) = \sin(x + y) \cos(x^2) \)

   b) \( h(x, y) = e^{x^2+y^2} + x \)

   c) \( k(x, y, z) = xyz + x^2y^2z^2 + x^3y^3 \)